ART. XII.—*Exsection of the Entire Radius.* By J. M. CARNOCHAN, Professor of Surgery in the New York Medical College, Surgeon-in-Chief to the State Hospital (New York), etc. (With a wood-cut.)

THE following case of the exsection of the entire radius is without precedent in the annals of surgery, and having already, in 1854, exsected, for the first time, the entire ulna, I am justified in claiming priority for my exsections of the long bones of the arm in their contiguities.

Surgical compilations have heretofore given credit to Butts, of Virginia, for the operation of exsecting the entire radius, but it appears that the operation actually performed by that surgeon, was not on the radius, but on the ulna; of which only the lower two-thirds were removed. (*Philadelphia Journal of the Medical and Physical Sciences*, vol. x. p. 115, 1825.)

As regards the ulna, a case of the "entire removal" of that bone, and "all but a portion of the end of the radius," is attributed by Prof. Blackman (*Mott and Blackman's Velpeau*, vol. ii. p. 460, New York, 1856) to Dr. Compton, of New Orleans. On looking, however, at the report as transcribed, several valid and insurmountable objections present themselves to the reception of the case as one of exsection. The operation is said to have been performed by Dr. Compton, but is reported by a "Medical Student," in a very confused and contradictory style. As reported, the case was one of compound comminuted fracture of the radius and ulna, wherein, "the arm was in a sloughing state, and both radius and ulna were actually shattered to pieces, and protruding several inches out of the mass of muscles." The bones are described as having been disarticulated at the elbow, and yet the arm is said to have remained at a right angle to the humerus, and still further, "that it could be flexed and extended." (*Id.*, p. 460.) The utility of an exsection consists in the preservation of function, by avoiding amputation, and it seems to be a physiological impossibility, that after the removal of the shattered fragments of both bones of the forearm—with destroyed vitality—the function of the muscles of the forearm should be preserved. Besides, although it might be conceded that in a case of chronic necrosis of long standing, new bone might be thrown out, to take the place of the original, yet such an occurrence cannot be admitted as possible in a case of traumatic necrosis, resulting immediately from a severe injury.

Case.—Daniel Kane, aged twenty, a native of Ireland, a laborer, strumous aspect, tall stature, free from syphilitic taint, received an injury by a severe blow upon the upper part of the forearm. This was followed by severe inflammatory action of the whole of the forearm, as well as of the upper arm, nearly as high as the axilla. The pain was excessive, deep-seated—depriving the patient of sleep and appetite—and accompanied by high constitutional fever. Anodyne applications, such as medicated fomentations and cataplasms, with suitable internal remedies, had been used under medical advice

in the city. Punctures along the swelling had also been made. This treatment had been continued for about three months, without much relief from the pain or diminution of the extent or the hardness of the swelling along the forearm, when he entered, as a patient, the surgical department of the State Emigrants' Hospital, on the 15th of November, 1853.

At the time of his admission, his countenance bore the evidences of severe and prolonged suffering. He was emaciated, feeble, and labouring under irritative fever. The hand, forearm, and lower half of the upper arm, were much tumefied and discoloured. The tissues of the forearm were hard, dense, and unyielding. The arm was much increased in circumference.

The pain still continued with unabated severity. A cataplasm, medicated with infusion of poppy-heads, was ordered over the swollen parts. Internally, quinine, porter, good diet, and a quarter of a grain of muriat. morph. at bed-time, were prescribed.

The elbow-joint now became immovable; and towards the inner aspect of the joint a slight fluctuation could be perceived.

A bistoury was passed into the abscess, down to the bone, and a small quantity of pus was discharged. About two days after this, another abscess formed upon the inner side of the forearm; this was opened in the same manner, and a considerable quantity of pus was discharged. About the 8th of December, matter was perceived near the wrist, on the dorsal aspect of the arm; this also was evacuated. From these different openings pus continued to be discharged in considerable quantities; the arm became somewhat less tumefied; the pain ceased to be so severe; the febrile condition subsided; and the general health showed signs of amelioration. Along with the pus small pieces of diseased bone were discharged, and the probe could be passed easily along the fistulous sinuses into the interior of the radius. These sinuses were of considerable length, running through the tissues of the arm to the extent of several inches, and opening at a distance from the cavities or abscesses in the interior of the bone. From December, 1853, to March, 1854, the fistulous openings continued to discharge considerable quantities of matter; the patient, in the mean time, being kept under tonics and nourishing regimen. From March till the following October, the condition of the patient remained much the same; at intervals, small pieces of dead bone continued to be discharged along with the pus. The patient's health did not improve, and the arm remained discoloured, swollen, indurated, and useless. It now became evident that the disease was one which could not be cured or ameliorated by medical therapeutics. The disease was evidently, from the first, an ostitis, followed by its most aggravated consequences—enlargement, caries, abscess of the bone, &c.

From the general tumefaction of the forearm, it was difficult to decide positively as to the extent of the ostitis; whether both bones were involved, or whether it was exclusively confined to one. The sinuses led to the radius alone, and the inference from this fact was, that the disease was confined to

that bone. Supposing this to be the case, the question arose as to the propriety of amputating the arm above the elbow, or of exsecting the radius in its contiguities. The success which had followed the exsection of the entire ulna, as reported by me, induced me to select the latter alternative; and, accordingly, I performed the operation on the 31st of October, 1854.

Operation.—The patient was brought into the amphitheatre, and placed supine upon the operating table. Assistants were arranged so as to maintain firmly the trunk and lower extremities; others were placed to be in readiness to hand the instruments, and sponge the wound; chloroform was cautiously administered. The humero-cubital articulation, during the progress of the disease, had become immovable, and the forearm remained flexed at an obtuse angle with the humerus. One assistant held and supported the upper arm of the diseased limb, compressing, at the same time, the humeral artery. Another supported the hand and forearm, and maintained the latter in such position as to expose conveniently the radial aspect. An incision was now made with a strong scalpel, in the direction of the axis of the radius, commencing at a point immediately below the external condyle of the humerus, and extending downwards to a point opposite, and a little behind, the styloid process of the radius; next, two other incisions were made at the extremities of the first one, extending transversely backwards, about three-quarters of an inch. These incisions extended through the integuments, and subcutaneous adipo-cellular tissue and fascia, which were thickened and indurated. The middle third of the radius was now easily reached, and made bare on its outer aspect, by dividing the intermuscular tissue, behind the extensor carpi radialis brevior.

The tissues were then separated, at this place, from the posterior aspect of the bone; the edge of the knife being kept close upon the bone. The knife was now carried along the corresponding anterior surface of the bone, using at times the handle, and dividing the fibres of the supinator radii brevis, so as to lay bare the anterior surface of the bone, as far as the attachment of the interosseous ligament, along its cubital border. The outer surface of the radius was further laid bare, by carrying the dissection upwards, between the extensor carpi radialis brevior, and the extensor communis digitorum. The muscular tissue, surrounding the radius at its upper part, was then detached from the different aspects of the bone, as far as the insertion of the interosseous ligament. Attention was now directed to the lower part of the radius; and here the necessity of preserving the different tendons, passing over the posterior part of the radius to the hand, required the greatest caution. The knife was carried behind the fleshy mass, composing the origins of the extensor ossis metacarpi pollicis, and the extensores primi et secundi internodii pollicis, detaching it from the radius, and the posterior part of the interosseous ligament. The tendons of these muscles were next insulated, and carefully dissected from their attachments, and from the groove beside the styloid process of the radius, along which they pass. The tendons of the extensor

carpi radialis longior and brevior were now insulated, and detached from the groove along which they pass. The tendon of the extensor indicis was next detached. The extensor communis digitorum, with its tendons, and the extensor minimi digiti were also liberated, and dissected from their respective grooves on the lower part of the bone; and the knife was then made to separate the supinator radii longus from its attachment.

At this stage of the dissection, it was deemed expedient to divide the bone at its central part, in order to facilitate the detachment of its articular extremities. An attempt was made to pass a large curved needle, for the purpose of introducing the chain-saw through the interosseous space; but this was found impossible, owing to the increased diameter of the radius, and its consequent approximation to the ulna. The various soft parts were now held apart from the bone, and protected by means of compresses; the bone was then nicked, and divided by a metacarpal saw through three-fourths of its diameter, the rest of the osseous section being completed by smart blows of the hammer on a chisel. The dissection was now continued, so as to remove the upper fragment, which was found to be immovable at the articulation with the humerus. The upper fragment was held by the forefinger and thumb of the left hand, and a blunt-pointed knife, curved flatwise, was slipped under the bone, so as to separate the interosseous ligament from its attachment. This ligament was next carefully detached upwards, as far as the insertion of the tendon of the biceps muscle. The knife was then carried upon the outer portion of the annular ligament, and this, with the external lateral ligament, was divided. It was now perceived that bony union had taken place between the inner half of the upper surface of the head of the radius, and the lower part of the humerus; with a small chisel this union was easily destroyed. It now remained to detach the insertion of the biceps muscle, which was somewhat difficult, because the increased size of the bone made it encroach upon the track of the artery.

Keeping the edge of the knife close upon the tubercle of the radius, the detachment was effected. It next remained to detach the lower fragment. By means of the blunt-curved knife, the interosseous ligament, and the pronator radii quadratus were detached from the bone. The different tendons running over the outer side of the radio-carpal articulation were now held aside by blunt hooks, and the radial artery was felt for, and also held aside. The bistoury was then carefully passed along, and under the styloid process, so as to divide the lateral ligament, and open the joint at the external part. The other tendons crossing the posterior aspect of the joint were also pulled to one side, so as to admit of the division of the posterior radio-carpal ligament. The articulation of the lower part of the ulna with the radius, was now opened upon its posterior aspect. The bone was next elevated and rotated, so as to permit the entrance of the knife at the external part of the joint, and the anterior radio-carpal ligament was divided. A few touches with the point of the bistoury completed the exsection.

The pressure on the artery was now removed, and the wound cleansed of blood. The hemorrhage, which was chiefly venous, became trifling. It was necessary to secure only the interosseous artery, and two small muscular branches.

During the operation, the radial, ulnar, and brachial arteries, escaped injury, as did also the median and radial nerves. The various tendons which have already been mentioned, were also insulated, and separated from their attachments, without in any case being divided.

Progress of Union.—After the oozing of blood had ceased, the different tendons were placed, as nearly as possible, *in situ*, and the edges of the wound were maintained together by points of interrupted suture: strips of adhesive plaster, a layer of perforated lint spread with balsam Peru cerate, scraped lint, compresses, with a retentive bandage, formed the dressing. The forearm and the hand, in a state of pronation, were then laid upon a well-padded splint, and secured in that position by means of a circular bandage.

At night, after the operation, an anodyne draught was given. Next day, November 1st, slight constitutional fever; pulse rose to 105. Patient restless, and suffering considerable pain; ordered an anodyne at bedtime.

Nov. 2. Had slept better, pain less severe, pulse 100. First dressings removed in the afternoon. Union of the lower portion of the wound by first intention for about two inches above the wrist. An anodyne at bedtime.

3*d*. Traumatic fever subsiding; wound dressed; suppuration profuse. Some sutures were removed; ordered sulph. quiniæ, two grains every two hours; muriat. morphia at bedtime.

During the following three weeks, with but little modification of the treatment, the patient continued to improve: the suppuration became less; the process of healing advanced favourably; and the lips of the wound were nearly united in its whole length. There remained two sinuses leading into the tissues of the arm; one opening near the elbow joint, another about the middle of the forearm.

22*d*. Iodide of potassium and cod-liver oil were substituted for the quinine.

During the following four weeks, the patient's general condition went on improving; he gained flesh; his countenance assumed the aspect of health; exercise in the hospital grounds allowed; the arm being kept in a sling.

1855. *January* 2. The sinuses had entirely healed, and the whole line of the wound cicatrized. The limb was still carefully and lightly bandaged, and the splint used, in order to give support to the hand, while the tissues along the radial aspect of the forearm were gaining solidity.

10*th*. Removed the splint, substituting the simple bandage. The patient allowed to use his hand and arm; general health restored.

Eleven weeks after the operation the patient was discharged cured.

Functions of the Arm, and its Appearance.—The patient returned afterwards, and was again admitted into the hospital for an internal malady, from which he soon recovered. He had regained, however, the use of his hand

and arm so much, that he was enabled to perform the duties of orderly in one of the surgical wards.

The radial aspect of the forearm presents the long cicatrix of the wound, and a depression exists along the original site of the radius. From the rigidity of the elbow joint, the forearm remains flexed at a convenient angle with the upper arm. The deformity of the limb is not so great as might be supposed would occur from the removal of the chief support to the hand.

The axis of the hand is not exactly in its normal direction, the hand being drawn slightly towards the radial side of the arm; and the styloid process of the ulna, from this circumstance, seems to project more than is natural. The functions of the hand are entirely preserved; as a matter of course, the power is not so great as it was, but, with this exception, prehension is unimpaired. He can carry a bucket full of water without difficulty, and can also write with ease.

The functions of the fingers are not diminished, and the sense of touch is as good as it was before the operation. The rigidity at the elbow joint is the result of the antecedent disease, and not of inflammatory action following the exsection. The functions of the wrist-joint, where the most trouble was to be anticipated, is but little interfered with. Flexion and extension are performed without difficulty; the hand can be turned prone or supine, and can also be adducted and abducted. The large arteries and nerves of the forearm were not injured during the exsection; and the muscular tissue, with the exception of those portions which had to be detached from the surface of the radius itself, was left intact by the knife. The various muscles which passed over the posterior and inferior part of the radius now, serve to effect extension of the wrist and of the fingers; such as the extensores carpi radialis, the extensor communis digitorum, the extensor minimi digiti, and the extensor carpi ulnaris.

In the new position which the hand has assumed, the extensores carpi radialis, with the extensor ossis metacarpi pollicis, and the extensor primi et secundi internodii pollicis, with the extensor indicis, aid in effecting abduction.

Adduction is effected by the extensor carpi ulnaris and the flexor carpi ulnaris; while flexion is performed by the flexor carpi radialis, the palmaris longus, the flexor carpi ulnaris, the flexor sublimis, the flexor profundus, and the flexor longus pollicis.

Pathological Condition of the Bone.—The diseased radius is represented by the accompanying wood-cut. Fig. 1 represents the posterior aspect of the upper half. Fig. 2, the lower or carpal half—the posterior surface.

The entire bone presents the characteristic appearances which result from prolonged and severe inflammation of the osseous tissue; the bone is expanded or enlarged in its whole extent; the measurement around, a little below the middle, is 4¾ inches, and the weight is seven and a half ounces; the weight of a healthy radius, recently removed, being only from two ounces and one drachm to two ounces and two drachms.

Fig. 1.

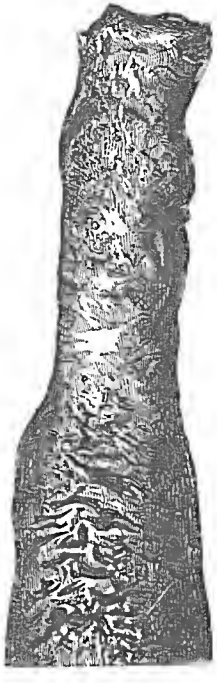

Fig. 2.

The upper third of the bone, when examined soon after its removal, presented on its anterior aspect the following appearances: the periosteum was partially loosened from its attachments and thickened, resembling softened cartilage rather than fibrous membrane. Numerous foramina were seen—enlarged, well defined, and hemmed round by mammillated eminences. The general surface of this portion, anteriorly, was rendered very irregular by the addition of new osseous matter, thrown out by the periosteum, and forming sulci, crests, and bridges of bone. The posterior aspect of the upper third was not so much altered; its surface, however, was rough and irregular.

The middle third was enlarged to a greater extent than any other part of the bone; being about five inches in circumference. It presented a surface more uniformly irregular than the upper third. The periosteum was mainly

adherent, and but little thickened. Beneath it the bone was found everywhere honey-combed by large foramina; the osseous matter around each foramen blending with that around the others in its neighbourhood, and giving rise to minute fissures and irregularities, running in every direction.

At different points cloacæ opened on the surface, and communicated with a central cylindrical canal, containing an undetached and spongy sequestrum. This canal was filled with pus, and formed an abscess in the interior of the bone. The section of this part of the bone and the surface show that new bone was being deposited from the periosteum and its processes, and that absorption was going on internally.

The lower third presented fewer marks of disease. It was, however, considerably enlarged; several enlarged foramina were seen on the anterior surface; while, on the posterior surface, a cloaca, extending into a purulent cavity, in the interior of the bone, and some irregularities on the surface, constituted the changes to be noted.

45 La Fayette Place, New York, *March* 1858.

ART. XIII.—*Account of a Monster of the Genus Peracephalus.* By WALTER F. ATLEE, M. D. (Read before the Biological Society of Philadelphia, March 1, 1858.)

THIS monster was the product of a double gestation, the mother being delivered at seven months. The child born first lived fifty-five hours; it was a female, and perfect with the exception of one club-foot; this monster came away about twenty minutes afterwards. One placenta was common to both. The mother was a healthy woman who had previously borne three children, in as many confinements. In the first two pregnancies the child was female, and born at seven months; in the third the child was male, and born at eight months and a half. The woman had received, so far as is known, no fall or fright in the course of her pregnancy.

The monster has no head or upper extremities. The trunk and lower extremities are of a size corresponding to those of a well-formed fœtus of seven months. A want of perfect symmetry, however, is very manifest, in the two halves of the trunk, which is remarkable for a number of elevations, with depressions between them. These elevations are due to the accumulation of a great quantity of cellular tissue. This sort of lumpy condition exists likewise in the lower limbs, which present, in addition, several other imperfections. The feet are turned inwards, and they possess but four toes, two of which, the smallest, on one foot, are not separated. The external organs of generation are those of the female; the anus exists.

Upon the front of the trunk, between the umbilicus and its upper extremity, is something having the appearance of a small empty bag or bladder, attached